THE ISTHMIAN CANAL.

AN ADDRESS BY
MR. GEORGE S. MORISON
BEFORE
THE COMMERCIAL CLUB OF CHICAGO
JANUARY 25, 1902

Mr. President and Gentlemen of the Commercial Club :

History has been making itself so fast in the last two or three weeks that I had somewhat changed my ideas as to what I had better say. I had determined to devote nearly my whole time to a description of the actual conditions on the Isthmus, and to giving reasons why the commission had reached some of the conclusions which it has. The remarks just made by my friend Ripley seem to make it important that I should first say a word or two in a different direction.

The first thing that I will call your attention to is the fact that although the old canals in America have almost all passed out of use, there has never been a time when canal construction has been more active in Europe than it is to-day, and there has never been a time when it has been considered as important a part of the transportation system of European countries. I do not know what the statistics are, but we all know that Paris is practically an inland city; it is a long way from the sea, and yet I feel perfectly certain that a good deal more than half the food and other supplies that are consumed in Paris are practically brought in by canal, either by local canals, of which France has a very extensive system, or by boats of the canal class on the Seine. This is a fact which should not be forgotten.

But the principal feature of the Isthmian canal, I think, may be said to be that it is not a canal in the usual sense. It is built, not to make canal navigation, not to increase navigation, but to reduce navigation. It is the formation of a short strait connecting two oceans. We have in this neighborhood another instance precisely like it, of a short canal connecting two seas, Lake Superior and Lake Huron, which now carries the heaviest tonnage that any canal ever has carried in the world; and it carries it, not because it is a canal, but in spite of its being a canal. It carries it because it is the only way of getting from one lake to the other.

If you will study the geography of the world, you will see that there is a very marked difference in the formation of the two continents. The Eastern Continent is broad from east to west; the Western Continent is long from north to south. The Eastern Continent has been completely circumnavigated. The passage around the Cape of Good Hope is a very easy passage, frequently made. The Western Continent has never been circumnavigated, and although the dream of a northeast passage has been a most enticing thing for centuries, it has had to be given up. Cape Horn is practically 20 degrees farther south than the Cape of Good Hope. Its passage is a very difficult one, especially in the winter season. The attraction of the Isthmian canal is that it will avoid the necessity of circumnavigating this continent. In spite of its being a canal it will make ocean navigation a great deal easier than it is now. The Suez canal has done this for the other continent, where the difficulties of getting around the continent were very much less. It remains to be seen what a canal across the American Isthmus will do. But its position and its importance is not because it is a canal, but in spite of its being a canal; a strait 20 miles wide would be a great deal better, but we cannot make it.

This subject of Isthmian transit is as old as any knowledge of the continent. The first dream of Columbus was to get a westward course to the Orient. He thought he had done it. He had not. The next dream actually accomplished it. Magellan found the straits, and on the boldest voyage that any navigator ever made, he crossed the Pacific Ocean, not knowing that only a short distance beyond these straits was the end of the land, which he might have gone around.

Of late years three different conditions of things have called special attention to Isthmian transit. The first of these was the discovery of gold in California; that was a little more than fifty years ago. It was at that time that the first surveys of any importance were made for lines across the Isthmus. The second was the Suez canal; when that was built, and was a success, its promoters felt that they wanted to do the same thing again; that it must be done by some one, and they would do it themselves; they tried and they failed. They failed for other reasons than those for which they should have failed, but it was a failure; that was about 20 years ago. The next thing which called attention to it was the voyage of the Oregon, one of the most graphic events in the war with Spain; the voyage of the Oregon was made through the straits of Magellan; it called everybody's attention to the fact that we could not get through the Isthmus.

In these three different periods a great change has taken place in the merchant marine. At the time the first surveys were made

for the Nicaragua canal, the first that were good for anything, by Col. Childs, about fifty years ago, there were only about 260 steam vessels in the world, of which only fifteen drew more than 17 feet; that was the size of ship which he made his plans for. At the time that work on the Panama canal was begun in 1882, a bottom width of about 70 feet and a depth of 29½ feet, those being the dimensions which had been adopted then on the Suez canal, though larger than the original dimensions, were considered ample. The bottom width of the canal was less than the beam of some warships which are now building. One steamship company alone in nine months sent out from New York City forty ships drawing over thirty feet.

We are particularly familiar here with the great change which has taken place in railroad rolling stock, and the enormous difference in trainloads. The present economical railroad transportation is due to heavy locomotives, to heavy rails which carry them, and to cars which can carry heavy loads themselves. Instead of cars carrying ten tons, as we had thirty years ago, we have plenty of cars carrying fifty tons, and they are sometimes loaded to sixty. The same thing has taken place on the ocean. There are fleets of steamers crossing the Atlantic which carry 12,000 tons of cargo. There is at least one ship running to New York, and there are others building, which, when fully loaded, would carry 20,000 tons of cargo. There is a matter which leads to a great deal of confusion in regard to the size of both ordinary merchant ships and battle ships. There are four different methods of measuring a ship. There is the actual displacement, which is the way naval ships are measured; there is the gross tonnage, which is an arbitrary rule established by law; there is the net tonnage, which is a reduction from the gross tonnage by an arbitrary rule established by law, and there is the carrying capacity; all four are different. There are several merchant ships now on the ocean whose actual displacement if fully loaded would be between 30,000 and 40,000 tons. I have not seen the displacement scale of the Celtic, but it must be close to 40,000 tons. The Oceanic runs up to nearly 32,000 tons when fully loaded.

It is these conditions, these increased dimensions, which have rendered ocean transportation as economical as it is. We have seen the same thing in this country. We have had railroads reducing their cost of transportation, we have had ocean steamers reducing their cost, and lake steamers have reduced it; the one trouble has been on the Mississippi River and its tributaries, which have not been able to reduce it; and what has been the result? The railroads have taken all the transportation away from the rivers except that class which can be carried without power, cargoes of coal and grain which can be taken down the Mississippi River

because the current of the Mississippi River takes them down ; but no considerable amount of freight can be brought back.

I have spent more time on this point than I had intended to ; but I wanted to speak of it particularly, because the route across the Isthmus which was best adapted to the light transportation of the past may be very poorly adapted to the transportation of the future.

The Nicaragua route has been favored, especially in America, for a great many years. Lake Nicaragua itself is but 12 miles from the Pacific, and the Continental Divide is between the lake and the Pacific. The drainage of the lake is into the Atlantic, Near the western end of Lake Nicaragua is the old City of Granada. In early times ships used to sail from Spain to Granada. They passed up the San Juan River, landed their cargoes at Granada, took their return cargoes and went back. I do not know how big those ships were, but they probably were about the same dimensions as the caravels which we saw here at the World's Fair a few years ago.

The transit company which operated a line from New York to San Francisco by way of Lake Nicaragua had steamers of about the size that then crossed the Atlantic. They would sail from New York, anchor in Greytown harbor, which was then a good harbor, although it has now disappeared, would transfer the passengers to river boats that came alongside. The river boat would go up the San Juan river to Castillo, where its passengers would get out and walk about a quarter of a mile around some rapids, take another boat which took them to the lake and across the lake and landed them within 12 miles of the Pacific, where a good stage road would take them in two hours to San Juan del Sur, where a steamer would be waiting for them. It seemed as if the San Juan river and Lake Nicaragua were an extension of the Atlantic Ocean, and that all that had to be done was to build a short canal between the lake and the Pacific and to improve the navigation of the river. The passage across this Divide was exceptionally easy. The stage road took the shortest route. The canal line would be about five miles longer, but the summit was but fifty feet above the lake, and everything was favorable to the construction of a canal. The one thing which was not seen at first, and which meant a great deal, but which means a great deal more now than it did then, was the fact that the San Juan River was but 100 miles long, and 100 feet higher at one end than at the other. It is a big river ; it is as big as the Mississippi is at Dubuque. It looks like a river which could easily be improved. But no river can have a fall of one foot to the mile without having very serious obstructions in it to navigation. In the upper half of the river those obstructions are rocks ; in the lower half they are sand bars. The first plan, that of Col. Childs' which was carefully

worked out, contemplated an extreme depth of 17 feet, a series of dams of small height, and of locks of small lift. It was the old-fashioned method of slack water navigation. All the dams in the lower portion of the river had to be founded on sand, and so they could not be high. While it might have been possible to maintain a 17 foot channel, it would not have been possible to maintain a 35 foot channel

Furthermore, midway between Lake Nicaragua and the sea, the San Juan River, which is the drainage of Lake Nicaragua, is joined by the San Carlos, a river coming down from the mountains, without having the advantage of the settling basin of a lake, which fills the lower river with sand bars and makes it something like the Platte. Those were the physical difficulties, but it was a very attractive line.

During the next fifteen years, the first change took place. Greytown harbor disappeared, and the last steamer that came to Greytown landed its passengers outside the bar, where they were brought in by small boats and taken up the river.

The difficulty of improving the San Juan River itself has become manifest. Practically, it cannot be done in the lower section of the river where it is full of sand bars ; when the Maritime Canal Company was organized a dozen years ago, and made its plans for work there, it recognized this fact and abandoned the lower end of the San Juan River. The scheme contemplated building a dam across the river which would carry the level of the lake down half way to the sea, extending that lake out between two rows of hills in a lateral valley to within eight miles of the Carribean, and then locking down into that sea Further examinations showed two very serious difficulties in the way of carrying out the plan. The first of those was that no foundations could be found for the dam. The second was that instead of two ranges of hills, with a valley between, there was but one range. There were some isolated hills on the other side, but they had to be connected with a series of very high and very insecure embankment. That was the position, and that was the plan five years ago.

When the Nicaragua Canal Commission was appointed, it was charged only with an examination of the Nicaragua location, and it made more complete surveys, though not by any means as complete as have now been made. The plan was abandoned. They selected another site for the dam and planned a canal nearly fifty miles long from the San Juan to the sea.

The plans of the present Commission are on the same lines, although the details have been very much improved. A better site has been found for the dam ; it is further up stream, and it has a better bottom. The canal between the improved San Juan and the

sea continues a portion of the scheme. It is this problem of constructing a canal nearly fifty miles long between the San Juan River and the ocean, not across the summit, but parallel to a river which cannot be made navigable, which has led to the increase in the estimates, and the increase in the apparent difficulties of the Nicaragua line.

If we assume this canal completed, a ship passing through the Nicaragua canal would enter Greytown harbor, which does not now exist, but which will have to be made, and would then travel 46 miles through a canal without interruption until it reaches the San Juan River at the elevation of the lake. In that distance it has to pass through four locks, and the canal itself is 46 miles long. Having entered the San Juan River, it would follow that river which would then be abundantly deep; but it is crooked, so crooked in fact, that some of the sharp bends would be cut off by short pieces of canal; it has to follow that river 50 miles to the lake. It is 100 miles in round figures from the Carribean Sea to Lake Nicaragua. Lake Nicaragua is a beautiful sheet of water. It is surrounded by high hills, and there are two mountains, volcanoes, which rise about a mile, right out of the lake itself. The navigable line would be for 70 miles through the lake, of which perhaps one-third would be in comparatively shallow water, where the channel has to be deepened, and the balance in deep water, which extends it to the west shore of the lake. Leaving the lake, a canal a little over 17 miles long with four locks would take the ship down to the Pacific, where, at present there is no harbor, but where an artificial harbor must be made. The total course of navigation consists, then, of about 65 miles of canal, of 50 miles of navigable river, with enough short pieces of canal to bring the canal length up to about 75 miles, and 70 miles of lake navigation, a total of about 185 miles. This can be passed according to the calculations made by a member of the Commission, by a fairly large ship in about 33 hours. The speed at which a ship would go through the canal would be practically independent of its own power. A fast ship must go just about as slowly as a slow ship. To pass through in that time is perfectly practicable, provided everything is favorable to operating by night. Smaller ships would undoubtedly travel by night; whether the largest ships would, is a question that only experience can settle.

The climate on the west side of the lake is very good for a tropical climate. The climate on the east side is one of the worst in the world. The rainfall at Greytown averages about 240 inches per year. The portion of the line through which the canal proper would be built, the first 50 miles between Greytown and the San Juan, is nearly as rainy as Greytown itself. It is a country practically with one wet season which lasts two years, doubling over the one that preceded it.

As you go up the river, the rainfall decreases until you reach the lake, where there is still a wet climate; when you cross the lake you come to one which is rather dry. The principal difficulty with Nicaragua is just where at first sight you would not expect to find it. It is between the river and the Atlantic. It is through the swamp, whose existence is largely due to the tremendous rainfall.

The principal problems to be met in the construction of the Nicaragua canal are the artificial harbors, which do not present

unusual difficulties, but they must be made before much work can be done ; the fifty miles of canal mostly through the swamp, but the upper portion of which involves some extremely heavy excavation, and finally the regulation of the lake. Lake Nicaragua furnishes an indefinite amount of water for a summit level supply. It furnishes almost too much water. It is so great a supply that the water used by the canal is immaterial in proportion to that required for evaporation. The difficulties lie in keeping the lake within reasonable limits, holding it high enough at the end of each wet season to prevent evaporation bringing it too low at the end of the dry season ; this difficulty will be better understood when it is remembered that there have been times, when two dry seasons had a comparatively dry wet season between them, when for 18 months the amount of evaporation exceeded the entire inflow into the canal. This regulation can be done. It has been worked out in a perfectly satisfactory way. The defect about it is that it will require constant and careful watching. The discharge of the river is large. It may possibly run up as high as 200,000 cubic feet a second ; but it would be regulated artificially by a system of sluices, which must be managed, closed and opened at the right times. This is nothing that has not been done successfully elsewhere. But I think that there is no doubt to-day that if we had the same problem before us that we had 50 years ago, and certainly if we had the one that we had a hundred years ago, to supply a waterway by which small vessels could go from ocean to ocean, Nicaragua would be the best route.

At Panama the situation is entirely different. The two oceans are only a little more than 30 miles apart in a straight line There is no intermediate navigation, unless you can call the old canoe navigation of the Chagres River, navigated by boats drawing perhaps a foot, navigation. The advantage of this location is that it is the only place where the oceans approach near together, and the summit is within reasonable height. The summit of Nicaragua, the lowest known, is about 150 feet above tide water. The summit at Panama at the lowest point, is a little less than 300 feet. On the line of the canal it is somewhat more than 300. There are other points on the Isthmus, east of Panama, where the width of the Isthmus is less than at Panama, but a careful examination along the line of the whole backbone shows that no place can be found where the height of the ridge is not more than double what it is at Panama. There is practically no place where the Isthmus can be crossed, except at Nicaragua and Panama without the use of a tunnel; and while some people may not hesitate to send ships through a tunnel, I do.

At Panama the Divide is about 10 miles from the Pacific. The actual length of the canal from shore to shore is a little more than forty miles The actual length from deep water to deep water is about 49 miles. There are two problems which have been the difficult ones at Panama. One is the Culebra cut, the other is the Chagres River.

When the French company began its work there, its people went at it with a magnificent and heroic ignorance. They proposed to cut a sea level canal, and to consider what they would do with other things afterwards. They located their line up the valley of the Chagres for about 30 miles, and then across the Divide in the

direction of the Pacific. They afterwards went into various schemes for keeping the Chagres River out of the canal; but nothing was ever done. The Chagres is a tropical mountain stream. It has an ample supply of water for the summit level of any canal, except for about three months in the year. During three months of the dry season its discharge may get as low as 300 feet or thereabouts per second. It looks as if it had dried up. During the greater part of the year, it is a river with a fair supply of water and a good stream. Once in a while, however there comes a tremendous flood. It is possible that the largest floods in the Chagres are as big as the largest floods in the San Juan, but that does not seem probable Those floods are like the floods that we sometimes see in this part of the country in the rivers in the southern part of this State. They are floods which come from violent rains; they do a lot of mischief, and before you know it they are gone. You have seen plenty of those. The problem of the control of the Chagres is to prevent those floods doing any harm. That problem has been perfectly solved by our Commission.

The first thing is to build a dam across the Chagres and convert nearly 20 miles of the river into a lake, that lake to be of such dimensions that no flood will produce a current in it which would do any harm. The surveys and examinations show that this is perfectly feasible; such a lake will form the summit level of the canal at an elevation varying between 85 and 90 feet, or about 13 feet lower than Lake Nicaragua, in which no current would be strong enough to do any harm, and which would ordinarily be a perfectly quiet lake in which navigation would be as easy as in Lake Nicaragua. A location has also been found at some distance from the Chagres where a masonry spill-way can be built, over which the lake will discharge in flood times, and the rate at which it would be discharged can be easily calculated. It is not probable that the flood water over that spill-way would ever be over five feet high, and the water can be taken from that spill-way to the sea without coming into the canal in the whole distance. I have seldom seen a problem more satisfactorily solved than this has been. Furthermore, the lake is to be large enough to supply, acting as a reservoir, the water needed for the summit level during the dry season when the river does not furnish enough. The whole solution, though an artificial one, is absolutely simple, and it will be entirely automatic when done.

When this is completed, a ship entering the Panama canal will navigate the canal for 17 miles at the level of the sea. Then by a flight of two locks, it passes up into this lake, called "Lake Bohio;" it will not pass through the entire length of the lake, but after passing through 13 miles it will turn off towards the south and go through the Culebra cut on the original French location.

This cut is about 8 miles long; it is heavy work for about 7 of those 8 miles; but it is exceptionally heavy only for one. The cut will be about 280 feet deep, and the work remaining to take out of it is about 40,000,000 cubic yards. That has been one of the bugbears of the Panama Canal.

The new French company, since the failure of the old one, has excavated a narrow slice in this cut, for more than two-thirds its depth, and has shown what the material is. It reminded me very much of material that I had taken out myself in North Dakota. It

is a very hard clay which costs as much to work perhaps as rock, but which weathers more or less when it is exposed But it is a perfectly stable material, and the troubles which have been reported of sliding soil, etc., are only on the surface well above anything remaining to be done.

Passing through this 8 miles of cut a ship would pass down a double flight of locks to a lower level, go one mile on this lower level, pass through another lock of varying lift according to the tide, and then in about six miles more would reach the line of the shore, and after four miles more in an excavated channel would reach deep water in the old anchorage in Panama Bay. The total length of this canal is about 49 miles from deep water to deep water.

These are brief descriptions of the two canals. The Nicaragua Canal from the ocean to the river, from the Atlantic to the San Juan, is practically as long as the entire Panama Canal from ocean to ocean. The difficulties of construction at Panama have been revealed by the work already done.

The Nicaragua route, however, has one advantage which has been very attractive to many people in this country. The west end of the Nicaragua canal is 500 miles nearer San Francisco than Panama. The trouble lies in the fact that a peninsula extends south about 200 miles on the Isthmus west of Panama; Panama is in about latitude 9°, and a ship going through the canal and up the west coast must make about latitude 7°. This means that when you are through the Nicaragua route you are much nearer to San Francisco and all our northern Pacific ports. This I think is the one advantage which Nicaragua has over Panama as a location for a deep draught canal. But against this there are several things which will weigh pretty heavily. The east end of the Panama Canal is nearer to New York than the east end of the Nicaragua Canal. The time required to pass the Panama canal is about 12 hours. The time required to pass through the Nicaragua canal is estimated at 33 hours. This means that a ship entering the Panama canal in the morning can pass the last lock before dark, and pass out to the Pacific or Atlantic Ocean as the case may be. It means that if a ship is to go through the Nicaragua canal, entering in the morning, she must spend the night in the canal and if she does not wish to run at night she must spend two nights there. If she goes through without stopping, even with a slow ship, one-half the saving in time on the Pacific is lost. If she lies up at night, all that advantage is lost. Beyond that, there is the increased risk of delays. Throwing out the whole of Lake Bahio, the actual length of canal navigation, not including the broadened harbors at Panama, is but little more than 30 miles; at Nicaragua it is in the neighborhood of 70. The risks of delay are hard to estimate; but if a ship grounds in a narrow channel or anything of that kind, all navigation is stopped until that ship is set free. That would increase much more rapidly than the length in which obstructions would occur, because not only would there be obstructions, but each delay would affect more ships. Probably the danger of delays would be four times as much at Nicaragua as at Panama.

There is also a difference in the cost of maintenance, which as far as we have been able to determine, is somewhat more than a million and a quarter dollars a year.

There is another advantage in favor of Panama, which I attach more value to, perhaps, than other people do. It would be a short strait from ocean to ocean, without any unnecessary complications with countries which it runs through. There would practically be no country; one end is almost within sight of the other; whereas, a line nearly 200 miles through the center of a country which would be more or less inhabited for the whole distance, might involve local international complications which it would be well to avoid.

There is also the question of protection. The canal would have to be protected, not defended against first class powers or fortified against strong nations, but it must be defended against the weak people who are around it. The trouble will be more in the nature of police than fortifications. At Panama a force can be brought from any point on the line of the canal to any other in less than two hours; probably if the railroad is maintained in high condition in one hour. At Nicaragua unless a railroad is built for the whole distance around the Lake, which has not been contemplated, it will take at least 12 hours; it will require a very much larger force, involving very much greater difficulties in policing.

These are some of the reasons why the Panama canal is to be preferred. They are not all. The question of cost is a very important one. The amount required to finish the Panama canal, according to the estimates of the Commission, and I think those estimates are ample, is about 140 million dollars. Of that a considerable amount can be deferred until after the opening of the canal. This estimate includes duplicate locks throughout, and it includes the deepening of the harbor channels at each end; this must be done sooner or later, but the present channels will accommodate a very large traffic so that I feel that there is no doubt that the canal can be opened to traffic with a present expenditure of somewhere from 110 to 120 million dollars. It would not be finished but it would be serviceable.

The Nicaragua canal has been estimated on precisely the same basis, the same prices for everything, the same percentage for contingencies, the same allowances, it being determined to put the canals as nearly on equal bases as possible. And yet, in a country uninhabited, as the country between Greytown and the San Juan River is, where all laboring population must be brought in, where every bit of country must be cleared, where no roads are possible because it is such a swamp, the risk of actual cost overrunning the estimates is considerably more than in the open country at Panama.

The work done at Panama by the old French company was of a reckless magnificence which has probably never been equaled anywhere. That company actually raised something like $240,000,000 in cash. Perhaps two-thirds of this went to the Isthmus. Perhaps one-half of that two-thirds was actually expended in excavation and work. A great deal of it went into machinery; some of that machinery is in good order, some of it is not. But those of you who have had to do with machinery know how much a machine is worth which is 20 years old. That is specially true of excavating machinery and everything of that kind. You had better throw it away. You could not afford to take it as a gift if you had to use it.

The value, however, which the French management attached to what they had done and to their machinery, their manner of esti-

mating it and their method of avoiding negotiations, were such that the Commission felt that the only thing it could do was to tell them to go home. It was a case where it was not merely a question of what we could afford to give for the work, but whether the United States Government could afford to be imposed upon by foreigners? The Commission decided that it could not. Now, this has been entirely changed. Not only has the management of the French company been entirely changed, but it has submitted an offer to accept for the entire plant the amount which the Commission has estimated that it is worth; and that amount, if paid for the Panama Canal, will be an absolute fixed payment with no chance for uncertainty or contingencies, with no possibility of a wrong percentage for uncertain errors. And it has accompanied that offer with legal documents showing that it can pass an absolute clean title to our Government.

That, however, would not enable our Government to build the canal. We could not work under any such concession as the French worked under. It would simply clear the ground so that we could make such treaty as we saw fit.

I do not know that I need say anything more on the merits of the two lines. The only advantage that I can see in Nicaragua, and I think that any engineer who has carefully investigated it will see, is the fact that the west end is nearer to San Francisco than the west end of the Panama Canal, and this is largely neutralized by the additional time required to pass through the canal, and entirely neutralized if you consider the additional risk.

There are some things about distances which I would like to call your attention to. They are easy to remember, and they are very suggestive. We all measure our longitude from Greenwich; Greenwich is practically London. The Mississippi River, as marked by St. Louis, Memphis and New Orleans, all of which are on the same meridian, is in longitude 90° west. The mouth of the Ganges is in longitude 90° east. The mouth of the Mississippi is directly opposite the mouth of the Ganges. The mouth of the Mississippi is almost north of where the Isthmian Canal would be. The mouth of the Ganges is a long way east of the Suez Canal. This means that very little business can be expected to go from any European ports through the canal across the American Isthmus. This canal must stand on its own merits. It must be a canal for American traffic. Furthermore, our Atlantic ports can reach Chinese ports by a little shorter route through the Suez canal than across the American Isthmus. Manila is about equally distant by both routes. Japan would be nearer by the American Isthmus,

Another thing: A great circle curve drawn from the terminus of either canal to San Francisco would be almost entirely on land, it would pass through New Mexico; the shortest route by which any vessel could go from the terminus of either canal to Japan would take them so near to San Francisco that San Francisco would naturally be a coaling port. The distance from Panama to Yokahoma, by way of San Francisco, is less than by way of Honolulu. San Francisco, furthermore, is the one port on the west coast of America which is nearest, not only to China and north Asiatic ports, but to Australia and New Zealand. There are some curiosities of this kind which it is important to think about.

From New York to San Francisco is 5144 miles by way of the Panama Canal. A 15-knot ship going 360 miles a day would make that trip in about 15 days, including the canal, if everything was all right; from Plymouth, which may be taken as a sample European port, the distance is 7674 miles. That would take 21 days including the canal, probably with coaling, etc., 23. The opening of the canal would place our Pacific coast in direct communication with our Eastern coast and with Europe. It would place our Eastern coast and the Mississippi Valley in direct communication with the West coast of South America, the trade of which is now held in European hands. This is a thing to which little attention has been given, but it is likely to prove a very important one. But after all I know of nothing which you can rely on less, than statistics of transportation on a transportation route which does not exist. The profits and the business of the canal must be the results of conditions which that canal will create. The French company made very nice calculations based on the position of ships all over the world for several years. But the real fact is that the opening of this canal will encourage certain interests on our West coast and elsewhere, which cannot fail, in my judgment, to change many lines of trade, and to create traffic which does not now exist. If it were only to be the traffic which does exist, I should agree with Mr. Ripley and doubt the expediency of building the canal.

There are two other things which should be referred to. We have a much larger merchant marine than is commonly supposed. Our navigation laws prevent our knowing what it is. No ship can sail under the American flag unless it is built in America; and the result is that other nations are getting the credit of shipping which we own. The International Navigation Company, for instance, owns four ships which sail under the American flag between New York and Southhampton. They own two or three auxiliary corporations, formed under English and Belgian laws, which own several times as many ships which are sailed under foreign flags. The heaviest freight carrying line now sailing out of New York is owned in this country, the Atlantic Transport Line, and yet it has not a single American ship. Possibly our navigation laws will compel a continuance of this abnormal condition. But whether they do or not, we are no longer out of the carrying trade. We are performing it secretly under other flags, and our ships will get quite as much benefit out of that as anybody, and we soon shall have as many as any nation.

Our coasting ships under our present laws can attend to our east coast and to our west coast. They cannot communicate between the two. With a canal they can. We could not take fleets through a canal in all probability in times of war. But the value of a fleet is not so much to fight in war, as to prevent the occasion of war; and the exercise and duties which an American fleet could perform with the existence of a canal, the change of stations and the discipline of squadrons would be very greatly improved. Our fleets would be much more effective, not perhaps in fighting, but in preventing the necessity of fighting.